CLAIMS

What is claimed is:

Sub A1

1. An optical add-drop multiplexing (OADM) device comprising:

a wavelength adapter module for transforming unstabilized non-monochromatic or monochromatic light energy into one or more channels of stabilized monochromatic light energy having one or more predefined wavelength regions; and

a filter module for at least one of dropping, adding, and recombining one or more channels of stabilized monochromatic light energy having one or more predefined wavelength regions, whereby information traffic carried by an optical waveguide is substantially increased.

2. The OADM device of claim 1, wherein the wavelength adapter module further comprises:

a light detector for converting light energy into electrical energy; and

a laser device for outputting modulated light energy in accordance with said electrical energy.

3. The OADM device of claim 1, wherein the wavelength adapter module further comprises an optical feedback assembly coupled to an optical waveguide.

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4. The OADM device of claim 3, wherein the optical feedback assembly comprises a Bragg grating.

3. ~~5~~. The OADM device of claim 2, wherein laser device comprises a laser diode initially producing unstabilized non-monochromatic or monochromatic light energy at approximately 1310 or 1550 nm wavelength region prior to stabilization.

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4. ~~6.~~ The OADM device of claim 1, wherein the filter module comprises:

a planar light guide circuit;

a plurality of filters disposed adjacent to said planar light guide circuit; and

a plurality of optical waveguides connected to said planar light guide circuit.

5. ~~7.~~ The OADM device of claim 4. ~~6,~~ wherein each filter comprises a thin film interference filter.

8. The OADM device of claim 1, wherein the OADM device is part of a SONET optical network.

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9. An optical amplifier comprising;

a light detector for converting light energy into electrical energy; and

a laser device for outputting modulated light energy in accordance with said electrical energy.

10. The optical amplifier of claim 9, further comprising a optical feedback assembly coupled to an optical waveguide.

11. The optical amplifier of claim 10, wherein the optical feedback assembly comprises a Bragg grating.

6. ~~12.~~ An optical network comprising:

a SONET network; and

a plurality of optical add-drop multiplexing (OADM) devices connected to a plurality of SONET network terminals;

each OADM device comprising:

a wavelength adapter module for transforming unstabilized non-monochromatic or monochromatic light energy into one or more channels of stabilized monochromatic light energy having one or more predefined wavelength regions; and

a filter module for at least one of dropping, adding, and recombining one or more channels of stabilized monochromatic light energy having one or more predefined wavelength regions.

7. ~~13.~~ The optical network of claim 6. ~~12,~~ wherein the SONET network comprises a protection switching scheme that operates irrespective of the plurality of OADM devices.

8. ~~14.~~ The optical network of claim 6. ~~12,~~ wherein each OADM balances information flow by propagating light energy containing information channels through respective optical waveguides connected to each OADM device, whereby a number of information routes between at least one of users and central offices are increased.

9. ~~15.~~ The optical network of claim 6, ~~12,~~ wherein the unstabilized non-monochromatic or monochromatic light energy is light energy propagating according to a predefined network protocol.

10. ~~16.~~ The optical network of claim 9. ~~15,~~ wherein the unstabilized non-monochromatic or monochromatic light energy is light energy propagating according to a synchronous optical network (SONET) protocol.

11. ~~17.~~ The optical network of claim ~~12,~~ 6. wherein the wavelength adapter module further comprises:

a light detector for converting light energy into electrical energy; and

a laser device for outputting modulated light energy in accordance with said electrical energy.

14 ~~18.~~ The optical network of claim ~~12,~~ 6. wherein the wavelength adapter module further comprises a optical feedback assembly coupled to an optical waveguide.

15. ~~19.~~ The optical network of claim ~~18,~~ 14. wherein the optical feedback assembly comprises a Bragg grating.

12. ~~20.~~ The optical network of claim ~~17,~~ 11 wherein laser device comprises a laser diode initially producing unstabilized non-monochromatic or monochromatic light energy at approximately 1310 or 1550 nm wavelength region prior to stabilization.

13. ~~21.~~ The optical network of claim ~~17,~~ 11 wherein laser device comprises a Fabry-Perot laser initially producing unstabilized non-monochromatic or monochromatic light energy at approximately 1310 or 1550 nm wavelength region prior to stabilization, said Fabry-Perot laser producing stabilized light energy at a predefined wavelength region within a spectral grid, said grid comprises a portion of either said 1310 or 1550 nm wavelength region.

16. ~~22.~~ The optical network of claim ~~12,~~ 4 wherein the filter module comprises:

a planar light guide circuit;

a plurality of filters disposed adjacent to said planar light guide circuit; and

a plurality of optical waveguides connected to said planar light guide circuit.

17. ~~23.~~ The optical network of claim ~~22,~~ 16. wherein each filter comprises a thin film interference filter.

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18. ~~24.~~ The optical network of claim 6. ~~12,~~ wherein the wavelength adapter module comprises a semiconductor laser in communication with a wavelength-specific reflector for stabilizing output of said laser, said reflector being part of a single mode optical circuit that propagates light energy between said reflector and an exit port of said laser, and said wavelength adapter module and said filter module form a unitary structure.

19. ~~25.~~ The optical network of claim 6. ~~12,~~ wherein said single mode optical circuit comprises a fiber optic cable.

26. A method for increasing a number of information channels carried by an optical waveguide, comprising the steps of:

transforming unstabilized non-monochromatic or monochromatic light energy into a plurality of channels of monochromatic light energy having one or more predefined wavelength regions with an optical add-drop multiplexing (OADM) device;

dropping one or more channels of stabilized monochromatic light energy having one or more predefined wavelength regions with the OADM device;

adding one or more channels of stabilized monochromatic light energy having one or more predefined wavelength regions with the OADM device; and

recombining one or more channels of stabilized monochromatic light energy having predefined wavelength regions with the OADM device, whereby information traffic carried by an optical waveguide is substantially increased.

27. The method of 26, further comprising the step of connecting the OADM device between a terminal and an optical network.

28. The method of claim 26, wherein the transforming step further comprises the steps of:

converting the light energy into electrical energy;

modulating a laser device with the electrical energy; and

outputting light energy from the laser device.

29. The method of claim 28, wherein the converting step comprises channeling the light energy into the input of a light detector.

30. The method of claim 28, wherein the converting step comprises channeling the light energy into the input of a photodetector.

31. The method of claim 28, wherein the modulating step comprises modulating a laser diode.

32. The method of claim 31, wherein the laser diode initially produces unstabilized non-monochromatic or monochromatic light energy at approximately 1310 or 1550 nm wavelength region before being stabilized.

33. The method of claim 28, further comprising the steps of:

filtering the light energy generated by the laser device;

reflecting filtered light energy of a predefined wavelength region back into the laser device;

stabilizing the laser device with the filtered light energy; and

outputting stabilized monochromatic light energy of the predefined wavelength region from the laser device matching the wavelength region of the reflected filtered light energy.

34. The method of claim 33, wherein the filtering and reflecting steps comprise filtering and reflecting the light energy with a grating.

35. The method of claim 34, wherein the grating filter comprises a Bragg grating.

36. The method of claim 26, wherein the dropping and adding steps further comprise the step of transmitting at least one of non-monochromatic and monochromatic light energy through a planar light guide circuit.

37. The method of claim 36, wherein the transmitting step includes cascading the light energy through a planar light guide circuit, said cascading comprising the steps of:

filtering at least one of the non-monochromatic and monochromatic light energy within the planar light guide circuit;

propagating filtered stabilized monochromatic light energy away from the planar light guide circuit;

propagating stabilized monochromatic light energy to the planar light guide circuit; and

reflecting the stabilized monochromatic light energy between one or more filters disposed within the planar light guide circuit.

38. The method of claim 37, wherein the filtering step further comprises filtering the stabilized monochromatic light energy with one or more thin film interference filters.

39. The method of claim 37, wherein the step of propagating filtered stabilized monochromatic light energy away from the planar light guide circuit further comprises channeling the filtered stabilized monochromatic light energy within an optical waveguide.

40. The method of claim 37, wherein the step of propagating stabilized monochromatic light energy to the planar light guide circuit further comprises channeling the stabilized monochromatic light energy within an optical waveguide.

41. The method of claim 26, further comprising the step of overlaying a plurality OADM devices on an optical network to increase the number channels carried by the optical network.

42. The method of claim 26, further comprising the step of overlaying a plurality OADM devices on a synchronous optical network (SONET) to increase the number channels carried by the optical network.

43. The method of claim 42, wherein the SONET network comprises a protection switching scheme that operates irrespective of the plurality of OADM devices.

44. The method of claim 32, wherein each OADM balances information flow by propagating light energy containing information channels through respective optical waveguides connected to each OADM device, whereby a number of information routes between at least one of users and central offices are increased.

45. The method of claim 26, wherein the unstabilized non-monochromatic or monochromatic light energy is light energy propagating according to a network protocol.

46. The method of claim 45, wherein the unstabilized non-monochromatic or monochromatic light energy is light energy propagating according to a synchronous optical network protocol.

47. A method for amplifying light energy comprising the steps of:

converting unstabilized or stabilized light energy into electrical energy;

modulating a laser device with the electrical energy; and

outputting light energy from the laser device.

48. The method of claim 47, further comprising the steps of:

filtering the light energy generated by the laser device;

reflecting the filtered light energy of a predefined wavelength region back into the laser device;

stabilizing the laser device with the reflected light energy; and

outputting stabilized monochromatic light energy of the predefined wavelength region from the laser device matching the wavelength region of the reflected filtered light energy.

49. The method of claim 47, wherein the converting step comprises channeling the light energy into the input of a light detector.

50. The method of claim 47, wherein the converting step comprises channeling the light energy into the input of a photodetector.

51. The method of claim 47, wherein the modulating step comprises modulating a laser diode.

52. The method of claim 47, wherein the laser diode initially produces unstabilized non-monochromatic or monochromatic light energy at approximately 1310 or 1550 nm wavelength region before being stabilized.

53. The method of claim 47, further comprising the step of propagating single mode light energy outputted by said laser device within a planar lightguide circuit.

54. The method of claim 48, further comprising the steps of:

outputting the light energy from a facet of a semiconductor gain medium; and

propagating the light energy through a single mode waveguided pathway before and after the reflecting step.

55. A method for amplifying monochromatic light energy of an optical network, comprising:

propagating monochromatic light energy having a plurality of predefined wavelength regions into a filter module;

filtering the monochromatic light energy into separate wavelength regions with the filter module;

feeding the separated light energy into a semiconductor device;

amplifying the separated light energy with the semiconductor device; and

feeding the amplified light energy back into the filter module.

56. The method of claim 55, wherein the semiconductor device comprises an active gain medium that undergoes stimulated emissions.

57. The method of claim 55, wherein the semiconductor device comprises a laser diode, the amplifying step further comprises the steps of:

converting light energy into electrical energy; and

outputting light energy from the laser diode.

58. The method of claim 55, further comprising the steps of:

filtering the light energy generated by the laser diode;

reflecting some filtered light energy of one of the plurality of predefined wavelength regions back into the laser diode;

stabilizing the laser diode with the filtered light energy; and

outputting monochromatic light energy at the one of the plurality of predefined wavelength regions from the laser diode matching the wavelength region of the reflected filtered light energy.

59. The method of claim 55, further comprising the step of propagating at least some portion of the light energy through a segment of a single mode optical pathway of a planar lightguide circuit.

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